Consequently, although many types of media, heat sensitive or otherwise, have been proposed as matrices for the electrokinetic separation of species in a channel, and numerous types of heat-sensitive media have also been proposed for other applications, there are currently no media exhibiting optimum properties for the said separations.

The object of the present invention is precisely to provide a novel type of separation media for which it is found to be possible to optimize the properties as a function of the size of the analytes which it is desired to separate through the selection of a specific copolymer.

For the purposes of the invention, the expression separation is intended to cover any method aimed at separating, identifying or analyzing all or some of the species contained in the mixture, the said species being commonly called "analytes".

This separation may thus be carried out in a channel in a microfluidic system or in the context of electrophoresis.

The invention is particularly advantageous in the case of electrokinetic separations.

The expression electrokinetic separation is intended to cover any method aimed at separating all or some of the species contained in a mixture, the said species being commonly called "analytes", by causing them to migrate in a medium under the action of an electric field, whether the field exerts its moving action on the analytes in a direct or indirect manner, for example via a movement of the medium itself, as in electrochromatography, or a movement of ancillary species such as micelles, in the case of micellar

electrochromatography, or by any combination of direct or indirect actions. Any method of separation in which the said action of the electric field is combined with another moving action of a nonelectrical origin will also be considered as an electrokinetic separation method according to the invention.

More particularly, the subject of the present invention is a heat-sensitive medium for the separation of species in a separating channel, the said medium comprising an electrolyte in which at least a set of block copolymers is dissolved, characterized in that the said block copolymers:

- are provided in the said electrolyte at a sufficient concentration to confer on the said medium the ability to reversibly transit from a viscosity state V1, obtained at a temperature T1, to a viscosity state V2 which is at least 100% higher than V1, obtained at a temperature T2 which is at least 20°C higher than T1 and

- comprising in their structure at least:

  - two noncontiguous polymeric segments exhibiting an LCST in the said electrolyte and possessing an average number of atoms along their skeleton which is greater than 50, and

  - a polymeric segment which is soluble in the electrolyte at the temperatures T1 and T2.

For the purposes of the invention, unless otherwise explicitly stated, all the average values on sets of chains or on sets of polymeric segments, such as the average molecular mass, or the average number of atoms along the skeleton, or alternatively the average number of grafts in the case of a comb polymer, are understood

to mean average values by mass within the usual meaning of polymer physics.

The separation medium claimed therefore possesses the capacity to reversibly transit between a fluid state with a fairly low viscosity so as to allow its introduction into the said channel, obtained at a temperature T1, and a state with a markedly higher viscosity, and in any case at least twice as high, obtained at a temperature T2 which is at least 20°C higher than the temperature T1. At the temperature T2, the said separation medium is endowed with significant separating properties for species in a predefined range of chemical composition and size.

The expression "temperature T1" is understood to mean, in the context of the invention, either a precise temperature, or a relatively narrow range of temperatures, of a level which is typically of the order of 10°C, useful for carrying out a particular operation relating to the separation process, and in particular for introducing the separating matrix according to the invention into the separating channel. According to a preferred variant of the invention, the temperature T1 is between about 15 and 30°C. Likewise, the expression "temperature T2" is understood to mean, in the context of the invention, either a precise temperature or a relatively narrow range of temperatures, of a level which is typically of the order of 10°C, useful for carrying out another particular operation relating to the separation process, and in particular for the step for separating analytes in the channel. According to a preferred variant of the invention, useful for the sequencing of DNA, this temperature or temperature range T2 is between about 40 and 80°C.

According to a preferred variant of the invention, the LCST of a significant fraction of the said segments